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FACTORS AFFECTING YEAR 12 RETENTION ACROSS AUSTRALIAN STATES AND TERRITORIES IN THE 1990'S

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CONTENTS

ABSTRACT

This paper contains a comparison of high school completion rates across Australian States and Territories from 1989 to 2002. These completion rates, known as 'retention rates', have a number of well-known deficiencies. When we adjust 'official' 2002 retention rates to take account of these measurement problems, the pattern of 'performance' across jurisdictions changes substantially. Moreover, the adjustments allow identification of the pattern of mismeasurement of national retention over the 1990s arising from the deficiencies of the retention rate calculation. We estimate that the retention rate was an especially poor measure of national school completion in the early 1990s, when it peaked. The peak in our adjusted retention measure during the early 1990s was less pronounced and the subsequent decline smaller than in the 'official' figures. Unlike those 'official' estimates, the adjusted measure of Year 12 retention was no lower in the late 1990s than it had been in the early 1990s.

1. Introduction

Retention at school to Year 12 has traditionally been used as an indicator of school system performance in Australia. For example, the 1989 National Report on Schooling in Australia indicated that State and Commonwealth Ministers for Education had 'agreed to work towards a national Year 12 retention rate of 65 per cent by the early 1990s' (Australian Education Council 1991: 8). In July 1991, the Finn Committee, on which all States and Territories were represented, recommended, " . . . that by the Year 2001, 95 per cent of 19 year olds should have completed Year 12, or an initial post-school qualification or be participating in formally recognised education or training" (Finn 1991: Rec. 3.2) [1]. As the policy focus on young people's participation in education and training has continued (eg. Kirby 2000, Ministerial Council on Education, Employment, Training and Youth Affairs – MCEETYA – 2001), Year 12 retention remains a key indicator of school system performance.

The Year 12 retention rate is measured as the number of students in Year 12 in a given calendar year divided by the number of students who were in the first Year of secondary school when that Year 12 cohort commenced secondary school. While comparisons of retention rates across jurisdictions have always been made, official publications have repeatedly pointed to a list of factors that limit their usefulness. One example is contained in the report of the Steering Committee for the Review of Commonwealth/State Service Provision (SCRCSSP, 2001), which listed the following confounding effects on attempts to make comparisons of retention rates across jurisdictions:

- Population changes, including international and interstate migration
- The effect of full fee-paying overseas students at upper secondary level
- Year 12 repetition
- The availability of part-time school study options
- The effect of alternatives to school education, most notably vocational courses available through Technical and Further Education (TAFE) institutions
- The different age-grade structures in the states (SCRCSSP 2001: 66 – 67).

Consequently, new approaches have been developed to make comparisons of school participation and completion across jurisdictions. In addition, more attention has been given

[1] For schools, the Finn report said that Year 12 retention rates should increase to 80 per cent by 2001.

to other aspects of school system performance. MCEETYA has developed key performance measures across a broader range of outcomes, such as literacy and numeracy; student participation and attainment; vocational education and training (VET) in schools; science and information and communications technology (MCEETYA 2000, SCRCSSP 2003). The Ministerial Council's *Annual National Report on Schooling* now publishes 'attainment rates' rates by age 19, in line with the Finn targets, along with 'full-time participation' rates, which include participation in full-time study or work and jointly in part-time work and study. The Australian Bureau of Statistics (ABS), which published the 'official' Year 12 retention estimates has also published a broader set of education system 'performance' indicators (ABS 2002). Nevertheless, it will be argued subsequently in this paper that indicators of participation (or attainment) require just as careful interpretation as differences in retention rates across jurisdictions. The requirement for care arises from the last point listed above – the different age-grade structures in jurisdictions have similar, substantial effects on alternative participation indicators to their effect on retention rates.

The aim of this paper is to estimate the impact of as many of the confounding influences identified above on retention comparisons with a view to assessing their importance. These various factors do affect the comparability of apparent retention rates across Australian jurisdictions. Nevertheless, it is possible to adjust the estimated retention rates in a manner that deals with each of these issues. The first two factors identified above can be handled simply through adjustments to the estimated retention rates that build in changes in the school-age population. The impact of grade repetition can be estimated from available ABS data in conjunction with regression analysis. The role of the last three factors can also be assessed with the aid of regression analysis.

The results presented here allow these various effects on retention rates to be estimated and corrected for comparative purposes. By far the most important of the 'problems' identified above in interpreting jurisdictions' Year 12 retention performance over the 1990s arises from differences in age-grade structures. The main structural factor contributing to these differences is the presence or absence of a preparatory or transition year prior to Grade or Year 1 in jurisdictions. This means that jurisdictions differ in the number of years of formal schooling in their education system – from 12 to 13 years. Both of the two main theories economists use to explain the importance of education on individuals' labour market outcomes – human capital and screening (or signalling) theory – provide an explanation for why jurisdictions with different age-grade structures might exhibit different school completion patterns. These explanations are set out in below (see Section 2.3.1).

The remainder of the paper is structured as follows. The next Section describes the methodology used here to analyse the 'problems' associated with retention rates and quantify their effects. The approach to identifying the effect of the most distinctive difference between jurisdictions – variations in age-grade structures – is explained there. The technical detail required for these analyses is contained in Appendices. A comparison of State retention outcomes over the 1990s is provided in Section 3. These results are used to re-assess what happened to national retention rates over the same period in Section 4. Section 5 attempts to place these estimates in the context of current directions in school system performance indicators. The policy implications of the results are identified there and in the conclusion.

2. How to adjust to retention rates

The 'official' Year 12 retention rates are estimates produced by the Australian Bureau of Statistics (ABS) of the proportion of any cohort who commence secondary school and proceed to Year 12 in the minimum possible number of years in a jurisdiction. Secondary school commences in Year 7 in New South Wales, Victoria, Tasmania and the Australian Capital Territory. It commences in Year 8 in other jurisdictions (Queensland, South Australia, Western Australian and the Northern Territory). Consequently, the calendar year in which the denominator is measured varies between jurisdictions for any Year 12 retention figure in a calendar year.

Most of the data used in the paper are taken from the National Schools Statistics Collection (NSSC), which is published by the ABS in *Schools Australia* (Cat. No. 4221.0) (see Appendix A for the sources of the data used here). While the NSSC includes information on government and non-government schools and staff, the analysis in this paper mostly uses information on students. Specifically, the focus is on full-time student numbers in each Australian State and Territory cross-classified by age and year or level of education.

There are two particular limitations in the NSSC data for the analysis undertaken below. First, the data do not allow identification of the prevalence of Year 12 repetition. Second, the data relate primarily to full-time students. While some data on part-time students have been published since 1995 by the ABS, it is only available by year or level (not by age) and earlier unpublished data are considered too unreliable for release. Since both of these factors are forms of school participation that individuals may choose and their incidence has reportedly changed over time, their mismeasurement in these data might affect the validity of the inferences drawn here. Attempts to estimate both of these phenomena from the published

data are described below. Other data utilised for this paper are drawn primarily from ABS sources. Appendix 1 contains the definitions of these variables and their sources.

The next three sub-sections describe the various adjustments we make to the 'official' ABS retention rate estimates anticipated in the introduction. The first sub-section describes the adjustment to account for population changes; the second how we estimate and account for Year 12 repetition; and the third the regression results that lie behind each of the adjustments we make for TAFE study, part-time study and differences in age-grade structures between jurisdictions. Separate appendices describe these various adjustments in more detail.

2.1 Retention rate adjustments to account for population changes

Adjusted retention rate measures for jurisdictions are calculated and used in this paper. Three adjustments to the standard definition are described in this sub-section (and in more detail in Appendix 2). They are made to produce estimates that are more consistent across jurisdictions and to minimise the effects of departures or additions on the cohort through either grade repetition or migration (both international and inter-state).

- First, for all jurisdictions, retention rates are estimated by dividing the number of Year 12 students in calendar year t with the number of Year 8 students in calendar year $t - 4$ (in jurisdictions with six years of secondary school, the 'official' estimate uses $t - 5$). This changes marginally the estimated retention rates for those jurisdictions where secondary school commences in Year 7, but leaves unchanged the estimates for jurisdictions where it commences in Year 8.

- Second, only those Year 8 students aged 12 to 15 years (inclusive) are counted in the denominator (these ages represented 99.8 per cent of Year 8 students in Australia in 1998) and only those Year 12 students aged 16 to 19 in the numerator (these ages represented 98.8 per cent of Year 12 students four years later in 2002).[2]

- Third, the estimates are adjusted for changes in the population of the relevant age cohorts in jurisdictions over these years. That is, population growth in each Year 8 single year of

[2] For 1991 and earlier years, the oldest age category in the ABS data was '19 years and older'. We used the observed 1992 share of 19 year olds among students aged '19 years' or '20 years or older' in jurisdictions to estimate those aged 19 years in Year 12 before 1992.

age cohort over the years to Year 12 is used to adjust the retention rate estimate. In effect, the denominator is increased to match population growth over the intervening years.

The effects of these adjustments on estimated Year 12 retention rates for 2002 are shown in columns two, three and four of Table 1, respectively. The estimates in the Tables are cumulative: the estimates in the fourth column include those of the second and third columns.

In the 'official' retention rate estimates, retention is highest in the ACT, Queensland, Victoria and Western Australia. The first two adjustments have very little impact on the estimated retention rates, other than in Tasmania, where 10 per cent of the Year 12 cohort in 2002 was aged 20 years or older. In 1998 in Tasmania, there were no Year 8 students older than 15 years (nor were there Year 7 students older than 14 in 1997). Hence this substantial group of students were clearly not original members of the grade cohort. The adjustment for population change has more of an impact in other jurisdictions, lowering estimated retention in most jurisdictions (the ACT, Queensland and Victoria especially), but raising it in Tasmania and the Northern Territory.

Overall, the three adjustments lower estimated retention by about four percentage points in Australia. While the effects are larger in some jurisdictions than in others, the adjusted figures do not change the relative retention position of jurisdictions in any significant way. It seems reasonable to conclude that these adjustments should not affect substantially the results reported in subsequent Sections.

2.2 Retention rate adjustments to account for Year 12 repetition

The retention rate estimates presented in the previous sub-section excluded those Year 12 students aged 20 years or older in July 2002. This adjustment will have removed some of the effects of Year 12 repetition. In this sub-section, we set out how we estimate Year 12 repetition within the four single age cohorts we treat as making up the grade cohorts.

We adopt a two-stage strategy to estimate the impact of Year 12 repetition on retention rates. In the first stage, we generate an estimate of Year 12 repetition in all jurisdictions in all years. It may be a poor estimate of 'true' Year 12 repetition, since there are no official ABS figures published on grade repetition. In the second stage we make assumptions about the way we have mismeasured the 'true' Year 12 repetition and use regression techniques in an equation designed to explain Year 12 retention to obtain better estimates of the extent of Year 12 repetition. The approach is described in more detail in Appendix 3.

Table 1: Adjusted Year 12 retention rates in 2002

Column No.	(1)	(2)	(3)	(4)	(5)
	Official estimates	Adjusted retention rates			
		Year 8 denominator	Cohort age restriction	Population correction	Year 12 repetition
NSW	69.9	69.9	69.7	67.0	66.4
Vic	80.9	80.5	79.9	75.4	74.1
Qld	81.3	81.3	80.4	76.2	74.8
SA	66.7	66.7	65.7	64.2	62.3
WA	73.7	73.7	72.5	69.2	66.5
Tas	72.6	73.1	65.7	67.5	61.4
NT	53.0	53.0	52.8	54.0	54.0
ACT	88.1	88.4	87.9	80.6	80.6
AUST	75.1	75.1	74.3	71.1	69.6

We adopt a very simple approach to estimating the first stage estimates of Year 12 repetition. Since repetition affects the age distribution of any grade, we endeavour to capture changes in the age distribution of cohorts as they move through school grades. We make assumptions about the average age of individuals in each single year of age group in any given grade and multiply those ages by the distribution of students across the ages in the grade to obtain an average age for the entire cohort in that grade. We then add one year to each age weight for estimation of the average age of the grade cohort in the following year in the next highest grade. Any change in the average age we attribute to grade repetition. These estimates are described in more detail in Appendix 3.

In the second regression stage, we estimate the determinants of Year 12 retention via instrumental variables (see the next sub-section and Appendix 4 for more details of the regression approach) and include our estimate of Year 12 repetition. We assume we have mismeasured Year 12 repetition and exploit another variable likely to be correlated closely with it that does not have an independent effect on our measure of Year 12 retention to obtain a better measure of repetition. This variable is the proportion of the total year 12 cohort that is older than 19 years of age in the ABS data. Such individuals are excluded from our calculation of retention, so the proportion is uncorrelated with our estimate of retention. However, a substantial proportion of such individuals will themselves be repeating Year 12

and it seems reasonable to assume that Year 12 repetition among those aged 20 years or older would be correlated closely with repetition among those aged 19 years or younger.

The regression parameter on the Year 12 repetition variable in the retention equation can be used to re-scale the repetition estimates obtained through the first stage described above. These repetition estimates can then be subtracted from the retention estimates to obtain repetition-adjusted retention rates. These are shown for 2002 in the last column of Table 1. Nationally, repetition added about one and a half percentage points to retention in 2002. This contribution varied considerably by jurisdiction, being higher in Tasmania, Western Australia and South Australia than in other jurisdictions. Another point of note, to which we return later, is that the contribution of repetition to retention in 2002 was substantially smaller than its estimated effect a decade earlier. We estimate that repetition added about three percentage points to (our adjusted) national retention estimates in 1992.

2.3 Regression-based adjustments to account for differences in education systems

In this sub-section, we outline a series of adjustments made to account for differences in State and Territory education systems. These adjustments are based on the parameters estimated from a regression equation designed to explain changes in retention rates in jurisdictions between 1989 and 2001. This period includes the final observations of the long period where school retention increased, its subsequent fall and 'plateauing' over the remainder of the 1990s. More detailed information about the regression estimates is contained in Attachment 4.

Essentially, we estimate a regression equation where the dependent variable is the adjusted retention rate estimate from which the fourth column of Table 1 is drawn. We use thirteen observations on each Australian jurisdiction in estimation. The explanatory variables include labour market and education system-related factors. The labour market variables are designed to capture both cyclical and structural factors likely to influence the employment opportunities for young people. The cyclical factors are captured through the change in annual state unemployment rates over the period. The structural factors are captured through measures of the annual state proportions of fifteen to nineteen year olds who work full-time.[3]

[3] This variable is likely to be endogenous (it failed Hausman 1978 tests), so we use lagged values of the proportion as instruments for current values in estimation. The equation was estimated via instrumental variable techniques, for this and reasons detailed below.

Differences in the education systems are captured with a series of variables. The first is the proportion of 17 year olds in a jurisdiction studying at a TAFE college in any year. This variable is interpreted as reflecting alternatives to school in jurisdictions, both educational and labour market alternatives, since apprentices and trainees are included in the TAFE student figures.[4] The second is an estimate of the proportion of the relevant Year 8 cohort studying part-time in Year 12. The third variable is the proportion of Year 8 students of any grade cohort who are indigenous. This was highest in the Northern Territory in 1998 at about 25 per cent of the grade cohort, but was no more than 5 per cent in the other jurisdictions.

2.3.1. Capturing the age-grade structure effect

Another education system-related variable is designed to capture differences in the age-grade profiles of jurisdictions arising from their different formal school systems. Before we describe that variable, we first set out three explanations of why different age grade-grade structures might affect observed school completion or retention rates between jurisdictions. The first is a human capital explanation, the second one is based on screening or signalling theories of education determination and the third on students' experience of secondary school.

In human capital theory, individuals choose an 'optimal' number of years of schooling they aim to complete that depends on the costs and benefits they face of alternative levels of schooling. These costs and benefits include, for example, the probability of obtaining a job and the incremental wages associated with different years of schooling, along with individual factors such as their innate ability, motivation, financial resources and preferences for schooling. Suppose individuals are distributed across choices that involve 10, 11, 12 and 13 or more years of schooling (the last category includes post-school education). Further, suppose the distribution is identical in each Australian jurisdiction. In jurisdictions with 13 years in their schooling structure, only those individuals whose optimal choice is 13 or more years of schooling will complete school. In jurisdictions with only 12 years in their schooling structure, all individuals whose optimal choice is 12 or 13 or more years of schooling will

[4] The equation is estimated by instrumental variables to account for the mismeasurement of Year 12 repetition, as detailed in Appendix 3. We also tested whether the TAFE variable was endogenous, but it survived a Hausman (1978) test. The instrument used for the test was the proportion of the population aged 20 to 24 studying at TAFE in each jurisdiction in each year.

complete school. School completion in these jurisdictions will exceed those with 13 years in the formal school structure by the proportion whose optimal choice is 12 years of school.[5]

The screening explanation of the way age-grade structures influence jurisdictions' school completion rates involves the interaction of those structures with the compulsory school leaving age.[6] Throughout Australia, young people are compelled to remain at school until they reach the minimum school leaving age of 15 years (or 16 in Tasmania). In jurisdictions with a preparatory or transition year prior to Grade or Year 1, substantial numbers of students turn 15 years of age in Year 9 and can leave school in that year. In the other jurisdictions, few students turn 15 years of age until Year 10. In screening explanations of the role of education, the main determinant of the level of schooling individuals choose is innate ability. Because schooling is financially or personally costly to acquire, the least able group of students leave at the earliest possible time (at age 15 in either Year 9 or 10, depending on the jurisdiction). Other individuals choose their education to differentiate themselves from this group to demonstrate their relative ability to employers (and hence earn higher wages). Some may choose just one additional year to indicate to potential employers they are not among the least able group, others two years to differentiate themselves from both lower ability groups and so on.[7] Suppose there are four ability types; in ascending order of ability, types '1', '2', '3' and '4'. Suppose type '1' individuals leave at the earliest possible opportunity. In jurisdictions with 13 years of formal schooling, the type '1' group leaves after Year 9, the '2' group after Year 10, the '3' group after Year 11, so only the '4' group complete Year 12. In jurisdictions with 12 years of formal schooling, the type '1' group leaves after Year 10, the '2' group after Year 11, so both the '3' group and the '4' group complete Year 12. The '4' group must undertake post-school studies to differentiate themselves from the '3' group. Consequently, jurisdictions with the same minimum school leaving age, but fewer years of schooling in their structure, will exhibit higher levels of school completion than those with more formal years of schooling.

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[5] Obviously, this description abstracts from the possibility that early school leavers continue their studies at other institutions. Providing this phenomenon does not vary too much across jurisdictions, it does not affect the argument. The description also assumes the preparatory year, where it exists, counts as a full 'year of schooling' or something close to it.

[6] School commencement rules do not differ so much across Australian jurisdictions to be important in the description that follows.

[7] A separating equilibrium is assumed.

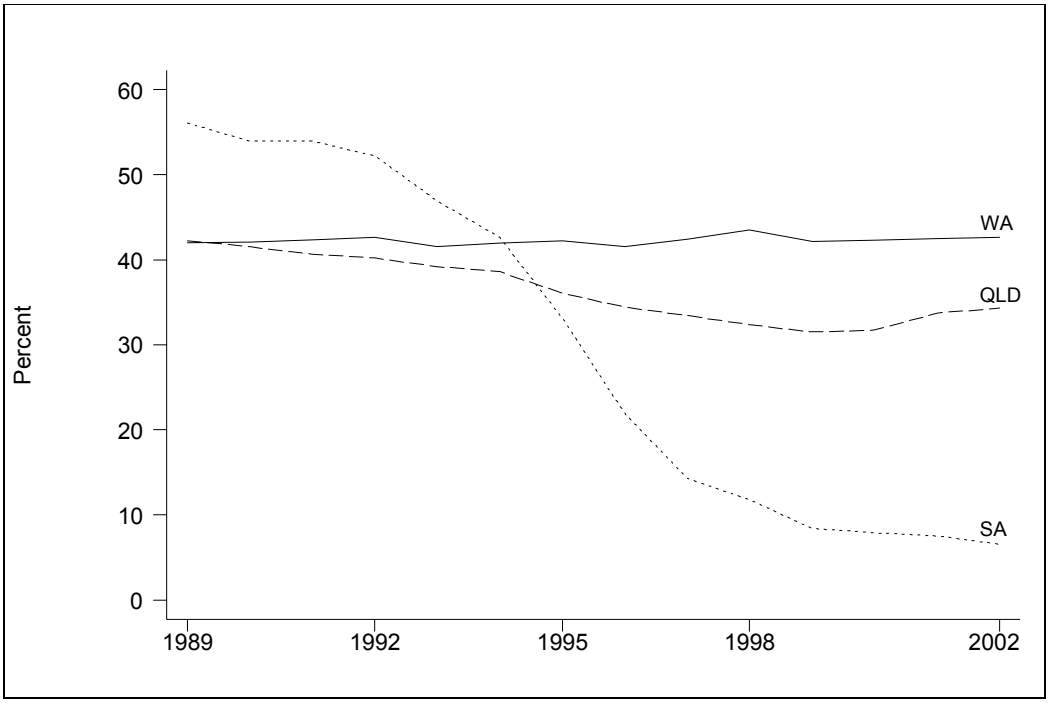
A third explanation as to why different age grade-grade structures might affect observed school completion or retention rates is that the secondary school curriculum and assessment institutions create barriers to participation for students at the bottom of the achievement hierarchy. Teese and Polesel (2003) suggest that the role of the secondary school curriculum as a sorting mechanism for higher education creates a sub-group of secondary students who are destined to 'fail' at school. This sub-group of students who do not perform well – in academic terms – are most likely to leave school early, regardless of their prospects of obtaining a job (NBEET 1995: 13-15). Students' motivation to invest time and effort in secondary school studies is closely related to their perceived level of achievement (Teese and Polesel 2003: 211). The hierarchy of the secondary school curriculum thus creates a sub-group of 'low achievers' who are motivated to leave school at the earliest opportunity – that is, the year in which they reach the minimum school leaving age. If the experience of 'failure' contributes to the decisions of students to leave school, more students face the likelihood of that experience in jurisdictions where the earliest leavers reach the minimum school leaving age in Year 9 rather than Year 10, using a similar recursive argument to that used in the description of the screening explanation.

The variable we use to capture differences in age-grade structures across Australian jurisdictions measures the proportion of 12 year olds in the Year 8 cohort.[8] Higher proportions of students aged 12 years reflect 'young' age-grade structures in jurisdictions. These proportions in 1998 are shown in the first column of Table 2 below. They vary markedly between jurisdictions. The proportion is highest in jurisdictions without a pre-Year 1 year of primary school (Queensland and – at the time – Western Australia). These proportions changed substantially in two jurisdictions in the period we analyse, both for reasons associated with school entry or early school progression policies.

The proportions aged 12 in Year 8 in Queensland and South Australia for the cohorts reaching Year 12 between 1989 and 2002 are shown in Figure 1, along with the proportion in Western Australia, which changed little over the relevant period. The decline in the proportion is more marked in South Australia than Queensland.

[8] There are other ways of characterising differences in the age distributions of cohorts, but their inclusion does not change the results. Since the proportion of students is the most intuitive measure, it is the one used here.

Figure 1: Proportion of Year 8 cohort aged 12 years (Year 12 cohorts of 1989 to 2002)



The changes in South Australia resulted from the implementation of the *Early Years of School* policy, announced in 1984 and implemented from 1985. The elements of the policy and its rationale were set out in Education Department of South Australia (1983), which drew on analysis in the final report of the Committee of Enquiry into Education in South Australia (Keeves Enquiry) (1982).

South Australia has a 'continuous admission' policy for 5 year olds (see Trethewey 1997 for a description of the history of this policy). It involves regular (not less than once a term) admission of recently turned five year olds into individual schools over the school year.[9]

The way it operated prior to the *Early Years of School* policy meant that those five year olds who began at the start of the school year (or late in the previous calendar year) moved directly into Year 2 after just one year. Essentially, they compressed Reception (the name of the preparatory year in South Australia) and Year 1 into just one year of school. Only children who entered school after first term moved into Year 1 in the following year.

[9] Of the other Australian jurisdictions, only the Northern Territory now has a similar policy. It operates only for children turning five in the first half of the year. Primary school in South Australia consists of Reception plus Years 1 to 7; Secondary school Years 8 to 12.

Prior to the reform, students who commenced school at the start of the school year (approximately those born from October to February) typically completed just two years of schooling before entering Year 3. After the reform, they completed three years before entering Year 3. Students who entered school later in the year, from March to June, were not affected by the policy change, while some born from July to September also did an extra year of schooling.

These changes had two major effects. First, from the cohort who reached Year 8 in 1990 and Year 12 in 1994, the grade cohorts began to get older (the proportion aged 12 in Year 8 began to fall). The change in the composition of the cohorts meant that the reported ages of students in Year 8 went from being approximately split between twelve and thirteen years in the ABS data prior to the change to predominantly thirteen years after it. The second effect, a consequence of the first, was that a substantial element of the grade cohort reached the minimum school leaving age of 15 years one grade or level earlier than had previously been the case, either late in Year 9 or just after they completed Year 9. Previously, almost the entire grade cohort turned 15 in Year 10.[10]

The changes in Queensland were less dramatic. In Queensland, the school entrance policy since the 1950s had allowed (but did not require) students to commence school at the start of the school year provided they turned 5 by the end of February. Over time this practice became less common. In 1986, the Education Department announced a new policy: that in 1987 students could commence school provided they turned 5 by the end of January, but from 1988 they could only commence school if they had turned 5 in the preceding calendar year. The 1988 cohort reached Year 8 in 1994, but as is evident from Figure 1, the proportion aged 12 in Year 8 in Queensland declined over much of the period we analyse.

[10] The proportion aged 12 in Year 8 also fell in Northern Territory and may reflect practice imported from South Australia, in part. There are close links between the South Australian and Northern Territory education systems. They share a common structure, have similar continuous enrolment policies for five year olds and common senior secondary certification arrangements (the South Australian Certificate of Education) which are administered by the same (South Australian) body. The South Australian Education Department administered the Northern Territory government school system until 1970 on behalf of the Commonwealth and its influence on that system quite obviously remains strong. However, the formal Northern Territory policy on progression for students through currently is similar to the South Australian policy before the introduction of the *Early Years of School* policy.

Other changes also took place to education systems at the upper secondary school level that may have affected Year 12 retention. Three jurisdictions introduced Certificates of Education that involved the completion at the required standard of a course of approved Years 11 and 12 study units undertaken over two or more years. Victoria introduced its Certificate of Education (VCE) in 1991 (it affected the Year 12 cohort of 1992). South Australia (and the Northern Territory) introduced the South Australian Certificate of Education (SACE) in 1992, which affected the cohort of students who reached Year 12 in 1993. Tasmania introduced the TCE in 1990, a certificate that covers student achievement from Year 9 to when they leave school (it therefore also affected the 1993 Year12 cohort).

Lamb (1996, 1998) reported that Year 12 repetition increased substantially in the late 1980s and early 1990s in South Australia and the Northern Territory following changes in certification requirements. Penalties imposed on the marks of students who repeated Year 12 were removed in the late 1980s, resulting in the growth in such students (captured in the ABS data). Changed arrangements for part-time students from the early 1990s apparently channelled repeating students through that route (part-time students are not captured in the ABS data). The overall outcome was that the changed certification arrangements first inflated the jurisdictions' retention rates then exaggerated their decline from 1992. Vickers and Lamb (2002) show that differences in educational structures between Australian jurisdictions explained divergent patterns of school retention in the late 1990s.

2.3.2 Summary of retention regression equation results

In this sub-section we report briefly on the estimates of the adjusted retention rate regression equation. The parameters from that equation are used in the next sub-section to make further adjustments to retention rates to improve their comparability across jurisdictions. We use thirteen observations from 1989 to 2001 on each Australian jurisdiction in estimation. The explanatory variables include the labour market (unemployment rates and the teenage full-time employment to population ratio) and education system-related factors (TAFE participation, indigenous share, part-time Year 12 students and the proportion in Year 8 aged 12 years) described already. The discussion of the results is brief, since the emphasis in the body of the paper is on using these results to adjust Year 12 retention to obtain comparable estimates across jurisdictions. The results are discussed in more detail in Appendix 4.

The regression results are reported in Table 4.2 of Appendix 4 largely confirm the role of education system effects on Year 12 retention. Retention is lower the higher the proportion of seventeen year olds who study at TAFE and the higher the indigenous share of the

commencing Year 8 cohort. The results imply that indigenous retention is about 30 per cent of that of non-indigenous Australians. That estimate seems low compared to estimates based on national figures in Long, Frigo and Batten (1999: 50) of just over 40 per cent. Our estimates are heavily dependent on retention patterns and the treatment of indigenous students in the ABS collection for the Northern Territory. Changes in the treatment of indigenous students in the Northern Territory affected apparent retention rates there from 1999.[11]

Retention is higher among jurisdictions with 'young' Year 8 cohorts and in jurisdictions where Year 12 repetition is higher. There was no evidence from the regression results that growth in part-time Year 12 student numbers had detracted from Year 12 retention, so that variable was excluded from the results presented. The results also confirmed the role of economic factors in explaining retention (both the long-term decline in full-time youth jobs and the role of cyclical effects through changes in the unemployment rate). Like findings in Larum and Beggs (1989) and Lewis and Kosky (1996), the results suggest that the decline in full-time job opportunities for teenagers was the main determinant of increased school retention. The impact of these various factors on national retention rate estimates is discussed in Section 4 below. In addition, there were significant remaining differences in retention outcomes between Australian jurisdictions.

2.3.3. Estimated regression-based retention rate adjustments

The estimated effects of the various 'education' system variables on retention in Australian jurisdictions in 2002 are reported in Table 2. These estimated effects are based on the parameters from Table 4.2 multiplied by the values taken by the explanatory variables in each jurisdiction in 2002.

Two effects covered in table 2 are substantial and change markedly the relative retention 'rankings' between jurisdictions. The results suggest that: first, both Queensland and Western Australia enjoy a considerable retention advantage over other jurisdictions by virtue of their

[11] The change involved reclassifying secondary-aged students in remote Aboriginal schools to an 'ungraded' category from 1995. This lowered the indigenous share of the 1995 Year 8 cohort by 10 percentage points compared with the 1994 cohort. Consequently, the apparent retention rate increased by 10 percentage in the Northern Territory between 1998 and 1999. This episode is likely to be very influential in the regression estimates. Also, the regression data are not weighted by the population, so they reflect retention by jurisdictions, rather than necessarily capturing national averages as in Long *et al.* (1999).

young Year 8 cohorts; and second, that a major element of the lower retention rates apparent in the Northern Territory arises from the substantial number of indigenous students there.

These various effects are incorporated into further adjusted retention rates for Australian jurisdictions in 2002 in Table 3. The first column of Table 3 repeats the 'official' estimates already reported in the first column of Table 1. The second column incorporates all of the adjustments from Table 1 and corrects for the age-grade structure via the age profile of the Year 8 cohort (column 1 from Table 2). The comparison is made across jurisdictions as if there was no Year 12 repetition and as if jurisdictions had no students aged 12 in Year 8. Column 3 and column 4 of Table 3 incorporate the Year 8 student body indigenous share and TAFE participation effects, respectively. Again, the comparison assumes implicitly that there are neither indigenous students nor TAFE study options in jurisdictions.[12]

Finally, and more speculatively, the last column includes an estimate of the full-time equivalent numbers of part-time students in the retention figures. The derivation of these estimates is described in Appendix 4. However, the argument for the final correction carried out in Table 3 is not strong. There is no evidence from the regression estimates that changes in part-time student numbers influenced the full-time student retention rate estimates. The variable was not significantly different from zero when the equation was estimated over the period when part-time student estimates are available in the ABS data. The variable was not statistically significant when the equation was estimated over the entire period either, where assumptions were made about part-time student trends over the period before part-time estimates were published.[13]

In light of the above, we do not use adjusted retention estimates that account for part-time student numbers in making comparisons across jurisdictions in the next section. Further, we do not adjust for differences in TAFE enrolments. From Tables 2 and 3, the extent to which differential patterns of TAFE enrolments confound comparisons across jurisdictions and over time is modest compared to the age-grade, indigenous share and grade repetition effects.

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[12] An alternative would have been to assign the Australian averages for students aged 12 in Year 8, the indigenous share and TAFE participation to jurisdictions. This would re-scale the estimates, but not affect the relativities between jurisdictions.

[13] These assumptions were 'sympathetic' to finding a negative effect of part-time students on full-time retention rates. We assumed that part-time student numbers increased from negligible amounts in 1991 to 1995, when the first numbers were published (our measure of retention was flat over this period), and were constant at 1991 levels in 1989 and 1991.

Table 2: Estimated effects on Year 12 retention – 2002

Column No.	(1)	(2)	(3)	(4)	(5)
	Proportion aged 12 in Year 8 in 1998	Effects on retention			
		Age-grade structure adjustment	Indigenous adjustment	TAFE adjustment	Part-time students (Full-time equivalent)
NSW	2.1	0.7	1.9	3.0	0.8
Vic	1.1	0.4	0.5	1.1	1.1
Qld	34.3	11.6	3.2	0.9	1.2
SA	6.5	2.2	1.8	1.0	7.4
WA	42.6	14.4	3.6	2.7	1.4
Tas	0.9	0.3	3.8	1.2	13.3
NT	10.0	3.4	19.0	0.0	4
ACT	0.8	0.3	1.0	0.5	0.1
AUST	12.8	4.3	2.2	1.8	1.9

Table 3: Adjusted Year 12 retention rates in 2002

Column No.	(1)	(2)	(3)	(4)	(5)
	'Official' retention	Age-grade structure and repetition adjusted	Previous column plus indigenous adjustment	Previous column plus TAFE adjustment	Previous column plus part-time adjustment
NSW	69.9	65.7	67.6	70.6	71.4
Vic	80.9	73.7	74.2	75.3	76.4
Qld	81.3	63.2	66.4	67.4	68.6
SA	66.7	60.1	61.9	63.0	70.4
WA	73.7	52.1	55.6	58.3	59.7
Tas	72.6	61.1	64.9	66.1	79.4
NT	53.0	50.6	69.7	69.7	73.7
ACT	88.1	80.3	81.3	81.8	81.9
AUST	75.1	65.3	67.4	69.2	71.1

3. The impact of the age-grade structure on Year 12 retention by State and Territory

The results contained in the previous section indicate that the retention 'rankings' of the various jurisdictions change substantially once aspects of the education systems of jurisdictions are taken into account. The main effects relate to the age structure of grade cohorts (with younger cohorts providing an advantage to jurisdictions in terms of their retention rate outcomes), and the indigenous share of grade cohorts (which provides a penalty). As demonstrated in Table 3, taking account of these factors changed the retention rankings of Queensland, Western Australia (their rankings fell) and the Northern Territory (the relative ranking rose) most markedly for 2002.

These adjusted, relative rankings were quite stable over the estimation period. A time series for each state comparable to the adjusted retention rates in column 3 of Table 3 shows Victoria and New South Wales with consistently higher rates than the other jurisdictions between 1989 and 2002. The time series for the states only are shown in Figure 2 between 1989 and 2002.[14] The rate in Queensland is consistently above that of the remaining states, while Tasmania (upwards) is the only jurisdiction to exhibit a trend change in its relative retention ranking over the period. This hierarchy is also evident in the jurisdiction effects captured in the regression results reported in Table 4.2 of Appendix 4.[15]

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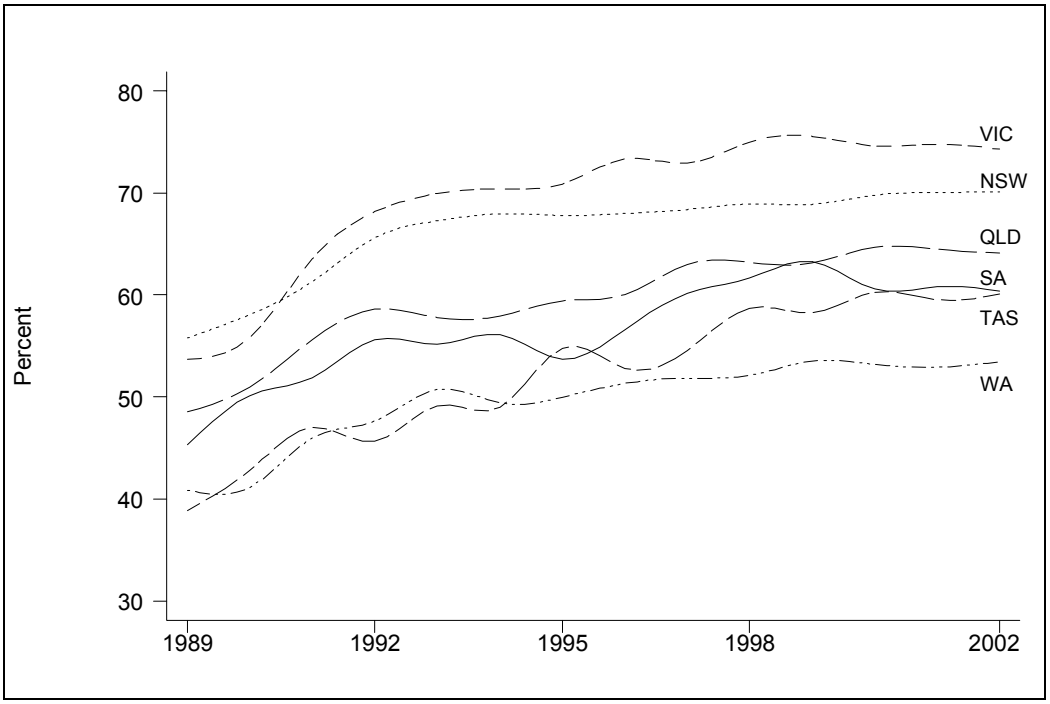
[14] The rates for the ACT are consistently the highest of any jurisdiction. The rates for the NT exhibit considerable 'noise' from year to year, primarily driven by variation in the estimated Year 12 repetition rates.

[15] Retention to Year 12 is not the only school participation measure of interest to policy makers. Were retention patterns over the 1990s representative of movements in other outcome measures of interest? We replicated the regression approach used here with three other dependent variables: school participation at age 17; school participation among 15 to 19 year olds; and Year 12 completion. The first two measures are published by the ABS, the second by the Department of Education, Training and Youth Affairs (DETYA) through the annual *National Report of Schooling in Australia* (Ministerial Council on Education, Employment, Training and Youth Affairs, MCEETYA, various years. DEST provided unpublished data for the period prior to 1995). The same explanatory variables were used to identify the effect of the various factors on the outcome measure, and the measure adjusted for differences in Year 12 repetition, age-grade structures and the indigenous share of Year 8 cohorts. A similar hierarchy was found in all of these equations to that of the adjusted retention equation.

Figure 2: Adjusted State Year 12 Retention Rates – 1989 to 2002[a]



(a) The data are smoothed for presentational purposes.

However, the time series in Figure 2 may have been 'over-adjusted', since they remove from the retention estimates the impact of policy changes. For example, the South Australian estimates remove any effect of the policy change that induced the ageing of grade cohorts in that state, estimated here to have lowered retention there by close to 14 percentage points between 1992 and 1998.

Another feature of note about Figure 2 is that none of the states exhibit the very sharp peak in retention in 1992 apparent in national 'official' retention estimates (see Figure 5 below). That is, most of the states had higher retention in 2002 than in 1992, the year the 'official' estimate of retention peaked. We take up the issue of the impact of Year 12 repetition and other retention measurement issues on national retention estimates in the next section.

4. What drove changes in 'official' national retention rates in the 1990s?

The regression equation used in earlier sections was designed to explain differences in retention between jurisdictions. All observations from all jurisdictions are accorded the same weight in the equation. Hence, the equation does not strictly 'explain' changes in the Australian retention rate over time, since this would require greater weight being given to observations from the more populous than the less populous jurisdictions.

Nevertheless, it is possible to use the results to identify the factors that appear to have played the greatest role in shaping Australian retention since the late 1980s.[16] We do this with the aid of a diagram, Figure 3, which shows the contributions of the variables included in the equation to changes in retention from 1989 to 2001. The value taken by each variable in each year was multiplied by the estimated parameter from the regression equation. The change in the impact of each variable on retention, relative to its 1989 effect, is shown in Figure 3, along with the actual change in retention and the aggregate predicted change.

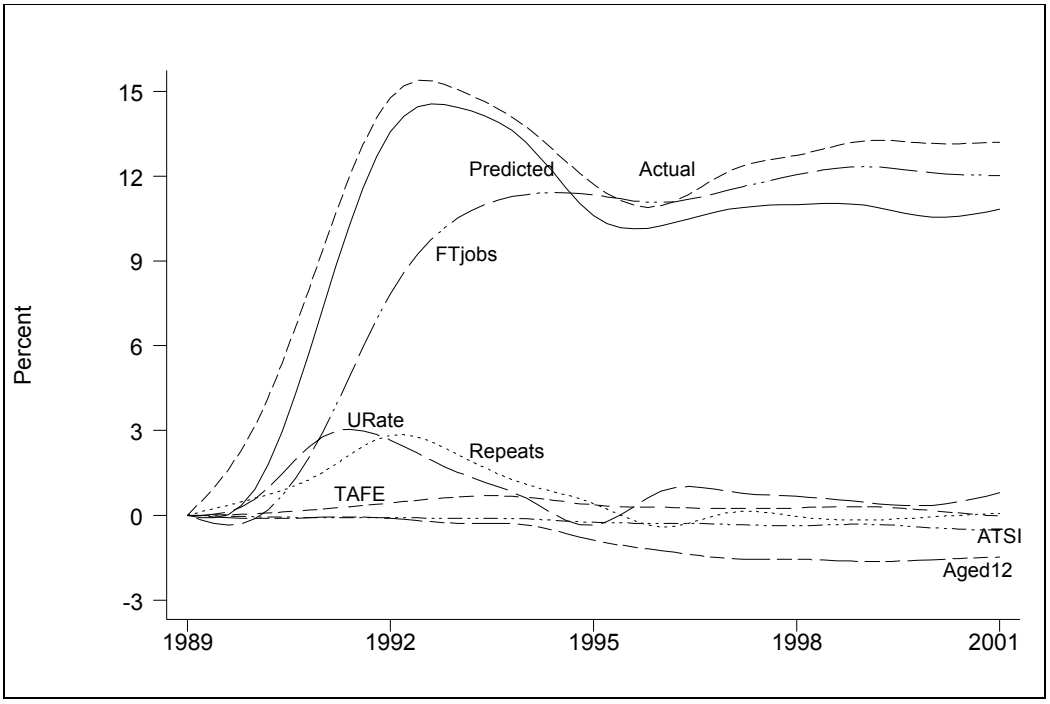
The first point to note about Figure 3 is that predicted retention, based on the regression equation, tracks changes in actual retention reasonably, though it fails to capture the increase in retention that occurred in 1990.[17] Thereafter, predicted retention increases quickly, peaking in 1992 and 1993 before falling and levelling off from 1995 about 10 percentage points higher than its 1989 value.

Three factors seem to have contributed most to the peak in retention. The broad magnitude of retention rate changes appears to have been driven by the decline in available full-time jobs for teenagers. Overlaid on this effect in the early 1990s were two other factors. The first contribution to retention was provided by the recession (through the increase in the unemployment rate), which added about three percentage points to retention in 1991. In reality, the teenage full-time employment effect also contains a substantial recessionary effect – the largest falls in that proportion occurred in the recessions of the early 1980s and 1990s, with the proportion being relatively stable in other years. The other contributing factor to the growth in retention in the early 1990s was the effect of Year 12 repetition, which added close to three percentage points to retention in 1992 (relative to its impact on retention in 1989). The relative magnitude of these latter two effects fell after 1992 and the impetus to retention from the loss of full-time teenage jobs slowed from 1993. Consequently, retention fell after 1993. In addition, another effect of a structural nature detracted from retention after 1994. Grade cohorts aged somewhat (the South Australian and Queensland changes described earlier), which had the effect of lowering retention by about one and a half percentage points.

[16] When the data were weighted according to population shares, the parameter estimates on the variables that measure full-time employment, unemployment rate changes, Year 12 repetition and the proportion aged twelve in Year 8 changed little.

[17] On average, the predictions from the regression equation must equal the actual values. The estimates in Figure 3 show retention growth relative to 1989 and suggest the predicted growth from 1989 was less than the actual, so the predicted values for 1989 must exceed the actual.

Figure 3: Contribution of explanatory variables to changes in national retention – 1989 to 2001[a]

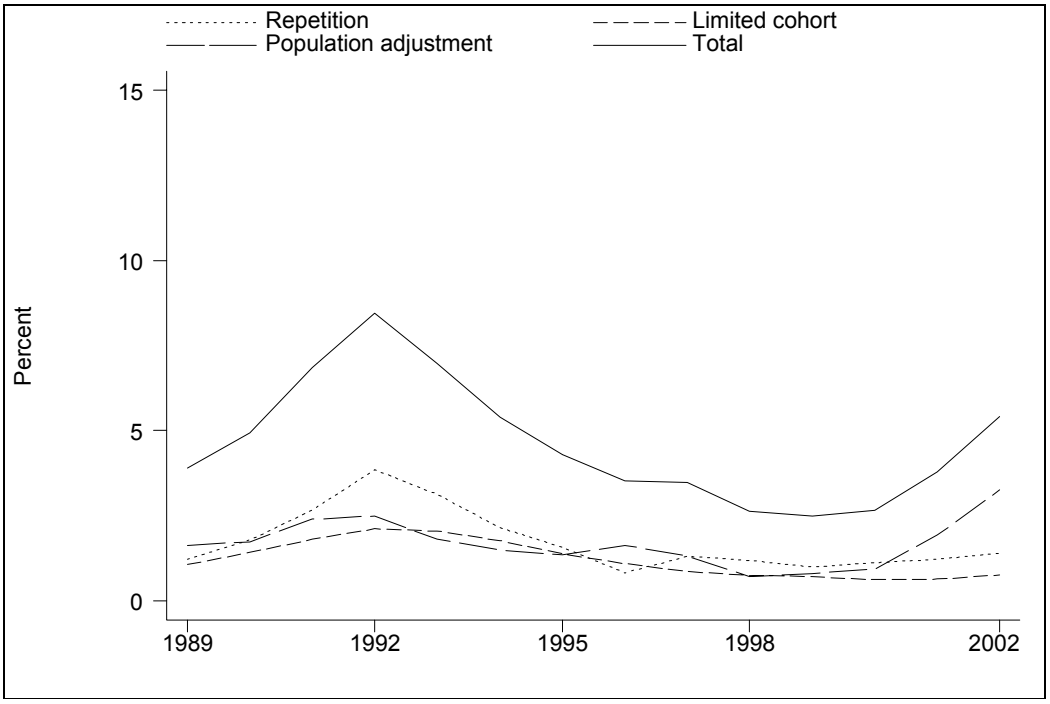


(a) The data are smoothed for presentational purposes.

These factors seem to provide a reasonable explanation for the changes in our adjusted measure of retention between 1989 and 2002. They are not a complete explanation for the pattern observed in the 'official' measure of retention, however. To do that, we need to return to how the 'official' rate is measured.

In Figure 4 we combine three factors that influence the 'official' measure that do not reflect true school completion by commencing Year 8 cohorts: school age population growth; the addition of older students to the Year 12 class; and Year 12 repetition. Between 1989 and 2002 these factors made varying contributions to the 'official' retention estimate. However, they all peaked in magnitude in either 1992 or 1993, and their sum peaked in 1992, adding about eight and a half percentage points to retention in that year. By 1996, the trough in 'official' retention in the 1990s, the contribution of these three factors had fallen by 5 percentage points, just less than the decline in 'official' retention over that period.

Figure 4: Contribution of Year 12 repetition, population growth and cohort additions to national retention rate estimates 1989 to 2002



Taken together these various effects suggest that the decline in 'official' national retention of six percentage points between 1992 and 1996 was made up of four elements. The first was the decline in the number of Year 12 students aged 20 or older which must have included a substantial proportion of students repeating Year 12. This effect contributed about one percentage point to the decline in retention. The second was the decline in Year 12 repetition among students aged 16 to 19 in Year 12. This effect contributed about 3 percentage points to the decline in retention. The third effect, of another percentage point arose from a decrease in the growth rate of the senior school age population. The final effect of about one and a half percentage points arose from the ageing of grade cohorts (the fall in the share of the Year 8 student body aged 12 years).

One result of some note, given their importance in pushing retention rates up, is that changed labour market conditions had no net effect on retention after 1992, because the effect of lower teenage full-time employment on retention was offset by better aggregate labour market conditions.[18]

[18] The parameters on the two labour variables in table 4.2 (the changes in unemployment rates and the proportion of 15 to 19 year olds employed full-time), in conjunction with the changes

After we correct the figures to take account of these measurement issues, what does the path followed by Australian retention over the 1990s look like? Figure 5 shows this picture. It contains the 'official' estimate of retention between 1989 and 2002, an estimate when the rate is adjusted only for population change and the older Year 12 students are removed, and a third estimate when the effect of Year 12 repetition is also removed (that is, these estimates include the earlier adjustment). No adjustment is made for the ageing of the grade cohort.

The picture from the population, cohort and repetition adjusted measure is somewhat different from that provided by the 'official' retention estimate. The peak in retention during the early 1990s recession is less pronounced, the subsequent decline smaller and the adjusted retention estimates exceed those of 1992 and 1993 from 1999. That is, unlike the pattern in the 'official' estimate, the measure of adjusted retention is higher at the end of the estimation period than it was during the recession of the early 1990s. Evidence on Year 12 'retention' or 'completion' from longitudinal data presented in Appendix 5 supports the proposition that it was no lower in the late 1990s than it had been in the early 1990s.

5. Implications for policy and performance measurement

Year 12 retention is now one among many measures of the performance of Australian school systems, partly due to the recognised limitations of the Year 12 retention rate as a performance measure, identified in the introduction to this paper. Yet this paper illustrates how appropriate use of the available data can rectify the problems with retention rates that prevent comparisons in school completion across jurisdictions and over time.

As emphasised in Section 3, the main commonly-identified factor that stands in the way of comparisons of retention between jurisdictions is differences in the age-grade structures of jurisdictions. Nevertheless, Table 3 and Figure 2 contain corrections for that factor. In reality, alternative participation and school completion measures are also affected by differences in age-grade structures (a point acknowledged in relation to school age participation rates in SCRCSSP, 2003: 3.28).

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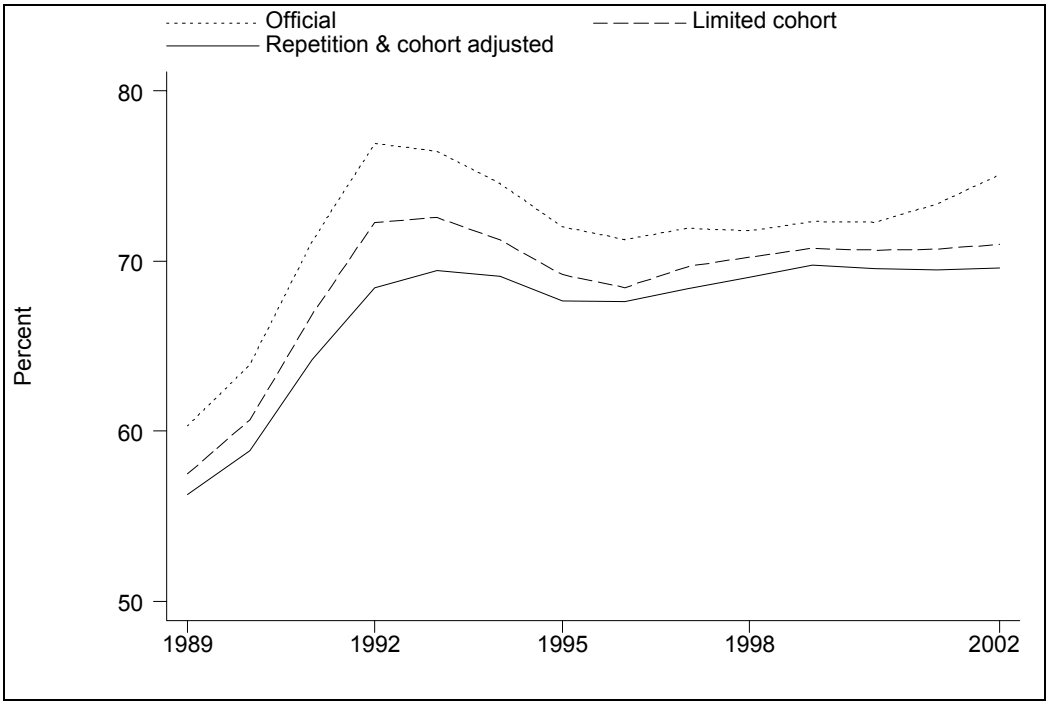
in the values of those variables, are consistent with about a forty percentage point change in retention between the late 1970s and the 1990s. This is the magnitude of the actual change in retention over the period. However, the parameters assign most of this change to the two periods of recession and do not pick up as much of the growth in retention that occurred between the two recessions.

Figure 5: 'Official' and adjusted national retention rate estimates 1989 to 2002



Just as jurisdictions with 'old' age-grade structures face a 'disadvantage' in relation to Year 12 retention compared to those with younger structures, these structures also affect their relative position in relation to measures of participation by age. However, the position of relative disadvantage is reversed. That is, jurisdictions with old age-grade structures are relatively advantaged by comparisons of school participation among individuals of a particular age. When the regression equation reported in Table 4.2 was estimated alternately with school participation among 17 year olds and among 15 to 19 year olds as the dependent variables, the proportion of students aged 12 years in Year 8 had a significant negative effect on participation in both equations. The extent of this degree of 'disadvantage' across jurisdictions is summarised in Table 4.[19] The relative 'poor' performance of Queensland and Western Australia improves after this 'disadvantage' is taken into account.

[19] This is calculated as the estimated parameter from the regression equation multiplied by the proportion of students aged 12 years in Year 8, taken from the first column of Table 2.

Table 4: Age-grade structures and their effect on age participation rates: 2002

	Age 17 participation rate			15 to 19 years participation rate		
	Estimated rate	Age-grade structure adjustment	Adjusted rate	Estimated rate	Age-grade structure adjustment	Adjusted rate
NSW	66.3	-0.8	67.1	50.2	-0.2	50.4
Vic	76.1	-0.4	76.5	55.4	-0.1	55.5
Qld	51.1	-13.8	64.9	45.9	-3.9	49.8
SA	60.1	-2.6	62.7	48.8	-0.7	49.5
WA	41.6	-17.1	58.7	43.2	-4.8	48.0
Tas	63.1	-0.4	63.5	53.3	-0.1	53.4
NT	43.9	-4.0	47.9	40.9	-1.1	42.0
ACT	88.9	-0.3	89.2	61.4	-0.1	61.5
AUST	62.8	-5.1	67.9	50.0	-1.4	51.4

School age participation rates have some clear advantages over retention rates in terms of their reduced potential for contamination. For example, they are not inflated by population growth or by the presence of older students (those aged 20 or older, in the case of the 15 to 19 years participation rate). On the other hand, Table 4 indicates that school age participation rates are just as subject to problems of comparison through differences in age-grade structures as are Year 12 retention rates. In addition, the Year 12 repetition variable was positive and significant in regression equations for the two age participation rates, pointing to another potential source of contamination for comparisons that use these measures.

By illustrating the extent to which labour market conditions 'drove' national Year 12 retention rates during the 1990s, this paper provides implicit endorsement for the broadening of school system performance measures that has taken place in recent years. Year 12 retention rates are influenced to a significant extent by the availability of full-time jobs for teenagers (see Figure 3) – an economic condition beyond the control of schools or school systems.

We should therefore be cautious in applauding rises in 'official' Year 12 retention rates as evidence of superior school performance or condemning falls without taking labour market conditions into account. While changes in the labour market over time may explain the pattern followed by national Year 12 retention over the estimation period, they are not the sole determinants of retention within and across jurisdictions. Unexplained differences in

retention performance between the jurisdictions (the state effects in Table 4.2) may point to differences in system performance that could be explored further (Vickers and Lamb 2002 point to some of the explanations for these effects).

Estimates of Year 12 retention may also be an important indicator of school system performance due to the recognised link between secondary school completion and subsequent success in the labour market (see, for example, Marks and Fleming 1998 and Lamb, Dwyer and Wyn 2000). The National Schools Statistics Collection upon which estimates of Year 12 retention and participation rates in Australia are usually based, is a key source of institutional-level data that could be enhanced for both policy development and performance measurement. Although this paper indicates how the existing data can be adjusted to produce more accurate measures of Year 12 retention and participation, such adjustments would be less important if the quality of the NSSC data was improved.

The usefulness of the NSSC data collection for policy and research would be enhanced if all secondary school students in Australia were assigned a unique student identifier for the purposes of the national data collection. Many Assessment and Certification Authorities in the States and Territories currently use unique student identifiers for tracking student achievement through Years 11 and 12. If this practice could be extended to students at the commencement of secondary school, or earlier, the NSSC would be able to provide accurate and reliable estimates of Year 12 retention and participation across Australia, including the role of Year 12 repetition and part-time studies. The use of a unique student identifier could also extend the scope of the national data collection beyond simple participation measures to include information about student achievement and possibly student transfers to other sectors of education and training (see Teese and Watson 2001).

6. Conclusion

Although government authorities acknowledge that a range of factors limits the usefulness of the estimates of Year 12 retention rates produced by the Australian Bureau of Statistics, these data are still widely used as a measure of school system performance in Australia. This paper indicates that the 'official' figures can be adjusted to accommodate the influence of these factors to produce more reliable and useful measures of Year 12 retention. These measures can be used for comparative purposes.

When the 'official' Year 12 retention rate for each State and Territory is adjusted to take into account of these various factors, we find:

- That by removing older age students from the Year 12 'cohort' and the effect of population change, Year 12 retention was about four percentage points lower than in the 'official' estimates in 2002. These adjustments do not change the relative position of States and Territories (Table 1). Over the 1990s, these factors made a varying contribution to retention, their contribution peaking in 1992 and 1993, when retention reached its 'official' maximum (Figure 4).
- Year 12 repetition added about one and half percentage points to national retention in 2002. This effect was larger in some jurisdictions (Tasmania, Western Australia and South Australia) than others (Table 1). Year 12 repetition also varied over time in its contribution to retention, with the effect peaking in 1992 and 1993 (Figure 4).
- Age-grade structures have a substantial impact on State and Territory education retention, completion and participation measures (Tables 2 and 4). They added over 10 percentage points to the 2002 Year 12 retention estimates for Queensland and Western Australia (Table 2). Those states faced a penalty from those same age-grade structures in their participation measures, however. That penalty was of similar magnitude to the retention benefit for participation among 17 year olds and approaching 5 percentage points for participation among 15 to 19 year olds (Table 4).
- The results are also consistent with the indigenous share of a school system's student body providing a major barrier to that system's retention performance. The effect was most pronounced in the Northern Territory, where the estimated cost to retention was almost 20 percentage points in 2002 (Table 2).
- TAFE participation has a more modest impact on comparisons of Year 12 retention across jurisdictions (Table 2). Part-time Year 12 studies may have a larger impact, but the regression-based evidence for this was weak.
- Removal of three important influences on retention in the 1990s: older age students in the Year 12 'cohort', the effect of population change, and Year 12 repetition, substantially changes the interpretation of the path followed by retention nationally (Figure 5). The peak in retention during the early 1990s recession is less pronounced in the adjusted estimates and the subsequent decline smaller. Unlike the 'official' estimates, adjusted Year 12 retention in the late 1990s was no lower than it had been in the early 1990s (Figure 5).
- The main reason Year 12 retention was higher in 2001 than it was in 1989 was the loss of available full-time jobs for young people. This factor contributed about 12 percentage points to the increase in retention over the period analysed (Figure 3).

Alternative measures of school participation or completion are subject to at least some of the same criticisms as those directed to Year 12 retention. Like retention, the alternative measures can be adjusted to remove the confounding influences. When this is done, these measures provide a similar picture to the adjusted retention estimates of national and jurisdictional performance over the 1990s.

While this paper has shown it is possible to adjust the National Schools Statistics Collection data to produce retention estimates that are more consistent across jurisdictions, it is always preferable to start with data that are already largely comparable. Efforts to increase the usefulness of the National Schools Statistics Collection via a unique student identifier would make comparisons across jurisdictions more straightforward and allow issues such as the impact of grade repetition and part-time studies on retention and participation to be addressed more directly than was possible in this paper.

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Appendix 1: Data definitions and sources

Data used in the paper involve:

- full-time student numbers in each Australian State and Territory cross-classified by their age and year or level of education, which is published by Australian Bureau of Statistics in *Schools Australia* (Cat. No. 4221.0). The reference period for the data in this publication is 1 July of the relevant calendar year;

- data on part-time students by grade or level are also drawn from *Schools Australia*;

- monthly total full-time employment, total unemployment rates, 15 to 19 year old full-time employment and 15 to 19 year old civilian population estimates in the various jurisdictions from the *Labour Force Australia* (Cat. No. 6201.0);

- annual estimates of TAFE participation by age and jurisdiction in September of each year from the *Participation in Education* (Cat. No. 6272.0). This publication ceased after 1999. For 2000 and 2001, growth in TAFE student numbers by age and jurisdiction published by the National Centre for Vocational Education Research, *Australian Vocational Education and Training Statistics: In detail*, were used to scale the 1999 ABS TAFE participation estimates. Estimates in Tables 2 and 3 use the 2001 values;

- State population by single year of age estimates in July of each year, taken from *Population by Age and Sex* (Cat. No. 3201.0);

- Year 12 completions by socio-economic status, also published in MCEETYA *National Report on Schooling in Australia*.

Appendix 2: Adjusting Apparent retention rates for Population changes

Let *i* subscript a particular single year of age cohort in calendar year *t*, the year in which it reaches Year 12. Let *x* be the number of levels between the first and last grades of secondary school in the jurisdiction and *S* represent the number of students in any cohort. Then the retention rate in any jurisdiction in calendar year, R_t, can be written as

$$(2.1) \quad R_t = \frac{S_{12t}}{S_{12-x,t-x}} = \frac{\sum_i S_{i,12,t}}{\sum_i S_{i-x,12-x,t-x}} = \sum_i \frac{S_{i,12,t}}{S_{i-x,12-x,t-x}} \times \left(\frac{S_{i-x,12-x,t-x}}{\sum_i S_{i-x,12-x,t-x}} \right)$$

$$= \sum_i (w_{i,12,t} \times v_{i-x,12-x,t-x})$$

where

$$w_{i,12,t} = \frac{S_{i,12,t}}{S_{i-x,12-x,t-x}} \text{ and } v_{i-x,12-x,t-x} = \frac{S_{i-x,12-x,t-x}}{\sum_i S_{i-x,12-x,t-x}}$$

That is, the retention rate is a weighted average of the retention rates for each age group within a Year cohort (the $w_{i,12,t}$). The weights are given by the shares of each age of the total Year cohort at the beginning of secondary school (the $v_{i\text{-}x,12\text{-}x,t\text{-}x}$).

The structure of schooling varies across Australian jurisdictions. Secondary school commences in Year 7 in New South Wales, Victoria, Tasmania and the Australian Capital Territory. It commences in Year 8 in Queensland, Western Australia, South Australia and the Northern Territory. Apparent retention rates are estimated from the grade where students commence secondary school. Hence the starting grade used in their calculation differs across jurisdictions. Our first adjustment to the 'official' retention rates, based simply on convenience for later analysis, is to estimate them from a common grade for all jurisdictions – from Year 8. Consequently, $x = 4$ in equation (1). This makes almost no difference to the estimates (see Column 2 of Table 1).

With our second adjustment, we estimate retention rates using cohorts of students aged only 16 to 19 in Year 12, and compare them with the student population aged 12 to 15 four years earlier in Year 8 in each jurisdiction. These ages covered 99.8 per cent of Australian Year 8 students in 1998 and 98.8 per cent of Year 12 students four years later in 2002. This

adjustment has a slightly more important impact on the retention estimates, but it is quite small nationally, lowering the estimate by 0.7 of a percentage point (Column 3 of Table 1). We adopt this restricted definition of the cohort for two reasons: it lowers the impact of grade repetition on our estimates and allows us to estimate the effect of repetition on the balance of the cohort more easily.

With these adjustments, equation (2.1) becomes

$$(2.2) \quad R_t = \sum_{i=16}^{19} w_{i,12,t} \times v_{i-4,8,t-x}$$

These estimated retention rates can be adjusted for population changes in a quite straightforward manner. We need to take account of any increases or decreases in the relevant cohort arising from either international or between jurisdiction migration. We do this by estimating retention rates as

$$(2.3) \quad R_t^* = \frac{\sum_{i=16}^{19} S_{i12t}}{\sum_{i=16}^{19} S_{i-4,8,t-4}} \times \frac{POP_{i-4,8,t-4}}{POP_{i,12,t}} = \sum_{i=16}^{19} w_{i,12,t}^* \; v_{i-4,8,t-x}$$

where

$$w_{i,12,t}^* = w_{i,12,t} \times \frac{POP_{i-4,8,t-4}}{POP_{i,12,t}}$$

and $v_{i\text{-}4,8,t\text{-}x}$ is as defined previously.

That is, we adjust the observed retention rate for each age within the grade cohort downwards where there has been any growth in the age group over the years of secondary school. The retention rate is then the product of those terms, multiplied by the original age share of the grade cohort.

These population adjusted retention rates are reported in the fourth column of Table 1. The population correction has very little impact on the estimated retention rates for 2002.

Appendix 3: Estimates of grade repetition

We adopt a two-stage strategy to estimation of the impact of Year 12 repetition on retention rates. In the first stage, we generate an estimate of Year 12 repetition in all jurisdictions in all years. It may be a poor estimate of 'true' Year 12 repetition, since there are no official figures published on grade repetition. In the second stage we make assumptions about the way we have mismeasured 'true' Year 12 repetition and use regression techniques to obtain better estimates of its extent.

Stage one

Grade repetition changes the age structure of cohorts as they move through school. As cohorts lose their younger members to lower grades and gain individuals from preceding cohorts, the proportion of the cohort who are in the older age categories must increase. This means the average age of the cohort increases by more than one year in each higher grade.

If grade repetition rates were constant across time and similar in each grade, repetition per se would have few implications for comparisons of aggregate retention rates. Essentially, inflows into cohorts would match outflows. Moreover, if the grade repetition rates were common across jurisdictions, the existence of grade repetition would not get in the way of comparisons of retention rates. However, repetition of Year 12 appears to be a more common phenomenon in recent times than repetition of other grades. What evidence there is about Year 12 repetition (discussed below) suggests that it has varied substantially across jurisdictions and over time.

We adopt a very simple approach to estimating the extent of grade repetition. Since repetition affects the age distribution of any grade, we endeavour to capture changes in the age distribution of cohorts as they move through school grades. We make assumptions about the average age of individuals in each single year of age group in any given grade and multiply those ages by the distribution of students across the ages in the grade to obtain an average age for the entire cohort in that grade. We then add one year to each age weight for estimation of the average age of the grade cohort in the following year in the next highest grade. Any change in the average age we attribute to grade repetition. That is, we estimate the repetition rate for Year 12 in calendar year t, $P_{12,t}$, as

$$(3.1) \quad P_{12,t} = \left[\left(\sum_{i=16}^{19} (i+\alpha)\ v_{i,12,t} - \sum_{i=16}^{19} (i-1+\alpha)\ v_{i,11,t-1} \right) - 1 \right] \times R_t^*$$

where

$$v_{i,12,t} = \frac{S_{i,12,t}}{\sum_{i=16}^{19} S_{i,12,t}} \text{ and } v_{i-1,12-x,t-x} = \frac{S_{i-1,11,t-1}}{\sum_{i=16}^{19} S_{i-1,11,t-1}}$$

and where $(i + \alpha)$ reflects the assumption we make about the average age of individuals in each single year of age group in the cohort. We assume that $\alpha = 0.5$, so that the average age of individuals aged 16 in Year 12 in July in any year is 16.5 years, those ages 17 was 17.5 years and so on. The value of α is not particularly important if grade repeaters are spread evenly across birth months within single year of age groups. In that case, repetition will add people who are on average one year older than the existing grade cohort to it. Therefore, any increase in the estimated average age of the grade cohort given by equation (3.1) will reflect changes in the age distribution of a grade cohort between neighbouring years arising from the effect of grade repetition.

The term in square brackets in equation (3.1) is the estimated share of Year 12 students who repeat in year *t*. Multiplying that term by R^*_t means that $P_{12,t}$ is the percentage point contribution made by Year 12 repetition to the adjusted Year 12 retention rate.

One problem with this approach is that it assumes that progression from one grade to the next by members of the cohort is the same for all of the single years of age. That is, we assume implicitly that the same proportions of 15 year olds in Year 11 become 16 year olds in Year 12 the following year as 17 year old Year 11 students who turn 18 in Year 12. This clearly need not be the case. Evidence from 1995 *Longitudinal Surveys of Australian Youth* Year 9 cohort indicates that it may not be a bad assumption, at least in the circumstances at the end of the 1990s. Retention to Year 12 in 1998 from Year 9 students aged 13 years was 75 per cent, from 14 year olds 77 per cent, from 15 year olds 74 per cent, but only 65 per cent from 16 year olds. This pattern has implications for our analysis, however. If true retention from the oldest age group is lower than the younger ones and our estimate of grade repetition is based on the share of older students increasing, we will systematically underestimate Year 12 repetition and may produce negative estimates. In fact we do produce some negative estimates of Year 12 repetition in some jurisdictions in the late 1990s. Nevertheless, what we

can infer from this is that Year 12 repetition was very low in those jurisdictions in those years.

Two versions of the initial retention estimates were generated. The first was the one specified above, while the second was the average of it and an alternative approach used in Ryan (2001). Both approaches provided similar initial estimates and outcomes from the second stage.[20]

Stage two

We now assume that our estimates of Year 12 repetition, $P_{12,t}$, vary by jurisdiction, $j = 1, \ldots J$, and mismeasure true Year 12 repetition, $P^*_{12,jt}$ in the following way:

$$(3.2) \quad P_{12,jt}, = \lambda P^*_{12,jt} + e_{jt} \qquad \Leftrightarrow \qquad P^*_{12,jt}, = (1/\lambda)\,(P_{12,jt} - e_{jt})$$

with $e_{jt} \sim (0, \sigma^2_e)$. That is, our estimated repetition departs from the true rate by some scaling factor and an error term. The scaling factor is assumed constant through time and across jurisdictions. If the true relationship between Year 12 retention and other factors is given by:

$$(3.3) \quad R^*_{jt} = \alpha_j + \boldsymbol{X}_{jt}'\,\beta + \boldsymbol{S}_{jt}'\,\gamma + \varphi\, P^*_{12,jt} + u_{jt}$$

where R^*_{jt} is the population adjusted Year 12 retention rate in jurisdiction j in year t (defined previously in equation 2.3), $\boldsymbol{X}$ is a set of economic variables and $\boldsymbol{S}$ a set of variables reflecting the structure of schooling in Australian jurisdictions and α, β, γ, and φ are parameters or parameter vectors to be estimated. In fact, $\varphi = 1$, since each Year 12 repeater is included in the retention estimate. If we substitute for $P^*_{12,jt}$ using equation (3.2), we get

[20] The alternative approach involved subtraction of the retention rate for the dominant cohort age group or age groups from the overall Year 12 retention rate in jurisdictions. For NSW, Victoria, Tasmania and the ACT, the dominant age group in the grade cohort is aged 13 years in Year 8 and 17 years in Year 12. In the remaining jurisdictions, the 12 and 13 year old groups (in Year 8) were aggregated and the retention outcome for those aged 16 and 17 in Year 12 were subtracted from the aggregate figure. Repetition will largely result in additional students who are older than these ages being included in the aggregate Year 12 retention rate. Hence, subtracting the retention rate for the dominant age group from the aggregate figure provides an estimate of the magnitude of repetition.

(3.4) $R^*_{jt} = \alpha_j + \boldsymbol{X}_{jt}' \beta + \boldsymbol{S}_{\boldsymbol{jt}}' \gamma + (\varphi/\lambda) P_{12,jt} + (u_{jt} - (\varphi/\lambda) e_t)$ or

(3.5) $R^*_{jt} = \alpha_j + \boldsymbol{X}_{jt}' \beta + \boldsymbol{S}_{\boldsymbol{jt}}' \gamma + \phi P_{12,jt} + u^*_{jt}$

where $\phi = \varphi/\lambda = 1/\lambda$ and u^*_{jt} is a composite error term. Because Year 12 repetition is measured with error, least squares estimation of equation (3.5) will produce biased and inconsistent estimates of the parameters (Greene 1997: 437). Consistent estimates of the parameters may be obtained through estimation of equation (3.5) by instrumental variables. This requires the existence of a suitable instrument, one that is correlated with Year 12 repetition, but not Year 12 retention except through the repetition variable. Note that if such an instrument exists, equation (3.5) would provide us with an estimate of $1/\lambda$. This parameter estimate would allow us to obtain a better estimate of 'true' retention from our estimated Year 12 repetition rate via equation (3.2). Our estimates in any year may be wrong, but on average, they will be of a similar magnitude to the true Year 12 repetition rate.

In fact, we possess a suitable instrument, one that is correlated with Year 12 repetition but not directly with Year 12 retention as we measure it. The instrument is just the proportion of the total year 12 cohort that is older than 19 years of age in the ABS data. Such individuals are excluded from our calculation of retention, so the proportion is not correlated directly with our estimate of retention. However, a substantial proportion of such individuals will themselves be repeating Year 12 and it seems reasonable to anticipate that Year 12 repetition among those aged 20 years or older would be closely correlated with repetition among those aged 19 years or younger. Hence the proportion of the total year 12 cohort that is older than 19 years of age in ABS data can be used as an instrument for our estimated repetition in equation (3.5).

The resulting repetition estimates from the two-stage estimation process appear in Table 3.1 for selected years. Evidence about the scale of our repetition estimates can be obtained from longitudinal data for the period 1991 – 93 and in 1999. This is presented in Table 3.1. The evidence suggests that our estimates may still understate the prevalence of Year 12 repetition.

Nevertheless, the resulting estimates of Year 12 repetition broadly match what little is known about it in Australia, where no official estimates are published. DEET (1994: 12) contains an estimate that at that time Year 12 repetition added about 4 percentage points to the national retention estimate in 1993. Morgan (1995) contains some estimates of Year 12 repetition in

Australian jurisdictions in the early 1990s, the magnitudes of which support earlier estimates in Russell (1993). Those estimates were based on figures provided by the various Boards of Study, who certify whether individuals complete their Year 12 studies at some required level. They showed that Year 12 repetition was highest in South Australia, Tasmania and Queensland, and in those jurisdictions where there was some kind of time series, that repetition had probably fallen by the mid-1990s from higher rates in the early 1990s. The estimates of Year 12 repetition derived here are lower than those contained in Morgan (1995), but match the pattern of those estimates: South Australia has the highest estimated rates and the estimates fell over the 1990s in all jurisdictions. The estimates used here are lower than those in Morgan (1995) for two main reasons: individuals aged 20 or older in Year 12 are excluded in this analysis; and these estimates are based on full-time students only from the ABS publication. Morgan (1995) found that quite large proportions of students in jurisdictions undertook less than a full load in repeating Year 12 (more than half in some jurisdictions). These individuals would not appear in the ABS full-time student figures, which would therefore tend to exhibit lower levels of Year 12 repetition than those of the jurisdictions' Boards of Study.

Table 3.1: Estimated Year 12 repetition rates

	ABS data			Longitudinal data[a]	
	1993	1999	2002	92-94	99
NSW	1.6	0.7	0.6	1.4	1.7
Vic	3.5	0.3	1.4	3.1	1.8
Qld	3.2	1.0	1.4	3.3	1.5
SA	6.9	1.0	2.0	20.6	6.3
WA	4.4	2.4	2.7	6.8	1.7
Tas	4.5	6.1	6.0	4.8	6.8
NT	0.3	0.8	0.0	6.2	10.0
ACT	0.0	0.0	0.0	3.0	2.4
AUST	3.1	1.0	1.4	4.7	2.3

(a) The 1992-1994 estimates are derived from the *Youth in Transition* 1975 cohort and the 1999 estimates from the *Longitudinal Surveys of Australian Youth* 1995

Appendix 4: Regression estimates of jurisdictions' retention rates

Econometric estimation of school participation or retention rate behaviour over time by young people has not been particularly satisfactory in Australia. The studies have found surprisingly little role for many economic factors that might be expected to influence school participation decisions. Kenyon and Wooden (1996) consider that all of the relevant studies 'are afflicted by data problems which give rise to severe multicollinearity' (1996: 30). These studies are discussed and summarised in Ryan (2001).

The approach adopted here is to estimate an equation that explains the Year 12 retention rates of Australian States and Territories from 1989 to 2001. This period includes the final observations of the long period where school retention increased, its subsequent fall and 'plateauing' over the remainder of the 1990s. The aim is to identify whether economic or school structure factors (or some combination of both) were responsible for the retention patterns observed in Australia's jurisdictions over the 1990s.

The estimated equation is of the form (repeated from equation 3.5): [21]

$$(4.1) \qquad R^*_{jt} = \alpha_j + \boldsymbol{X}_{jt}'\,\beta + \boldsymbol{S}_{\boldsymbol{jt}}'\,\gamma + \phi P_{12,jt} + u^*_{jt}$$

where all variables and parameters are as described previously in Appendix 3. The intercept is allowed to vary by jurisdiction, but other parameters are constant across jurisdictions and over time. The error term u^*_{jt} is assumed to satisfy $E[u^*_{jt}] = 0$ and $Var[u^*_{jt}] = \sigma_j^2$, that is, it has a zero mean and its variance is constant over time but allowed to vary across jurisdictions. [22]

The $\boldsymbol{X}_j$ variables include changes in state unemployment rates to capture cyclical effects and the proportion of 15 to 19 year old working full-time to pick up the effects of structural

[21] It is common to estimate the logit form of equation (4.1), that is with the dependent variable specified as $\log[R^*_{jt}/(1- R^*_{jt})]$. This specification is estimated because retention rates (conceptually) should lie between zero and one and this transformation ensures that the predicted values will lie in that range. This approach is followed in many studies, such as Lang and Kropp (1986), Forster and Ryan (1989), and Karmel (1995). Results from both specifications are reported below, with the least squares estimates emphasised because they are marginally more straightforward to interpret.

[22] The standard errors were estimated taking account of the 'clustering' of observations by jurisdiction.

changes in the youth labour market. Like Karmel (1995), we allow for the cyclical effects to have an asymmetric effect on retention – deteriorations may add more to retention than improved conditions detract from it. Other variables that captured differences in the relative sizes of age cohorts were also included, but these effects were not significant and the variables are excluded from the results presented.

The observed retention behaviour for any cohort reflects decisions made over a number years by members of the cohort. For example, the number of students observed in July of each year in Year 12 reflects the decisions made by those leaving at the earliest possible time (generally in Year 9), followed by decisions taken at the end of Years 10 and 11. Therefore, the economic conditions pertaining at any of those times could have affected retention, not just the conditions when the cohort reached Year 12. Consequently, for any particular cohort that reaches Year 12 in some year, the value included for any specific economic variable is its average value over the two prior financial years. For example, for the cohort that reached Year 12 in 1991, averages for the economic variables from 1989-90 and 1990-91 were used.

To deal with part-time study, an estimate was made of the proportion of the original Year 8 cohort studying Year 12 part-time in jurisdictions. There are two sources of measurement error in this part-time study estimate. The first is that the ABS only began to publish part-time student numbers from 1995. Total part-time students in government schools by jurisdiction in 1994 were reported in Steering Committee for the Review of Commonwealth/State Service Provision (SCRCSSP 2000). The second source of measurement error is that the ABS does not publish part-time student figures by age. Therefore, the age of those enrolled in Year 12 is not known.[23] Various assumptions about growth in full-time equivalent part-time students prior to 1994 were made and the resulting variables included in regression equations.[24] Alternatively, the equation was estimated only over the period since the ABS began to publish the part-time student numbers. The part-time student variable was never significantly different from zero and generally of the 'wrong' sign if part-time students do detract from full-time Year 12 retention (it was positive). Consequently, the variable was excluded from the results reported.

[23] It is known for some states. For example, about 20 per cent of part-time Year 12 students were aged 20 years or older in South Australia in both 2000 and 2001 (Department of Education, Training and Employment 2001, 2002).

[24] The estimates in Morgan (1995) suggest that there were substantial numbers of part-time students in Year 12 in South Australia and some other jurisdictions prior to 1994.

For reasons outlined in the body of the paper and the previous Appendix, equation (4.1) was estimated by instrumental variables to account for the endogeneity of the teenage full-time employment proportion and the possible mismeasurement of the Year 12 repetition variable.

The regression results are reported in Table 4.2 and the variable means in Table 4.1. The parameters on the economic variables in Table 4.2 have the expected signs. Declines in available full-time jobs add to school retention, as do generally poor labour market conditions. Like Karmel (1995), we find that general labour market conditions have an asymmetric effect on retention – deteriorations add to retention, but improved conditions do not lead to reversals in retention.

Specification tests suggested that linear forms of the explanatory variables did not capture non-linearities in retention over the estimation period. These were captured adequately with a quadratic term for the proportion of teenagers working full-time. However, the parameter on that variable itself varied between jurisdictions, being significantly larger in jurisdictions with older grade cohorts than younger ones.[25] A separate parameter on that variable was estimated for two sets of jurisdictions: one for the NSW, VIC, TAS and the ACT group; the other consisting of the remaining jurisdictions. The results imply that the loss of teenage jobs had a greater impact on retention in those jurisdictions where students tended to be older for a given grade. The loss of teenage jobs in states with older grade cohorts may have had a larger impact on retention because it changed the opportunity cost of remaining in school for potential school leavers in such states by lowering the probability of employment.

The equations survived RESET specification tests and the parameter estimates were robust to the inclusion of other variables subsequently excluded from the results presented. Alternative specifications involving other economic variables did not affect the parameters of the education system variables. The standard errors are 'robust' estimates to account for different error variances between the states and for any serial correlation in the errors.

[25] Wald tests suggested the linear terms for the teenage full-time employment proportions could be excluded once the quadratic terms were included.

Table 4.1: Means of retention rate equation variables (1989 to 2001)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
Retention rate	0.658	0.748	0.778	0.735	0.706	0.582	0.475	0.912
Adjusted retention rate	0.639	0.717	0.719	0.710	0.657	0.570	0.479	0.837
Logit (Adjusted retention rate)	0.249	0.404	0.409	0.389	0.282	0.123	-0.036	0.710
Proportion aged 12 in Year 8	0.024	0.017	0.366	0.316	0.422	0.020	0.223	0.015
TAFE proportion	0.102	0.052	0.057	0.076	0.138	0.084	0.114	0.026
Year 12 Repetition	0.003	0.014	0.009	0.020	0.019	0.026	0.005	0.026
Unemployment rate (increases)	0.4	0.5	0.3	0.4	0.4	0.3	0.3	0.3
Unemployment rate (decreases)	-0.5	-0.5	-0.4	-0.5	-0.5	-0.3	-0.6	-0.3
Indigenous share of Year 8 students	0.019	0.004	0.038	0.019	0.044	0.031	0.313	0.007
Full-time employment share of 15-19 population	0.216	0.181	0.233	0.206	0.267	0.233	0.223	0.146
17 year old school participation	0.635	0.720	0.461	0.471	0.382	0.533	0.396	0.886
15-19 year old school participation	0.495	0.531	0.439	0.454	0.412	0.480	0.400	0.609
Year 12 Completion rate[a]	0.656	0.697	0.691	0.718	0.587	0.689	0.367	0.820

(a) Mean of values from 1991 to 1999.

Table 4.2: Retention equation regression results

	Adjusted retention rate			Logit of retention rate		
	Coeff.	Std.Err.	t-ratio	Coeff.	Std.Err.	t-ratio
Year 12 Repeats	1.577	0.44	3.55	7.080	2.22	3.19
Full-time employment share squared (NSW, VIC, TAS, ACT)	-2.277	0.17	-13.46	-9.980	0.83	-12.06
Full-time employment share squared (QLD, SA, WA, NT)	-1.248	0.24	-5.28	-6.434	1.11	-5.78
Proportion aged 17 at TAFE	-0.190	0.09	-2.10	-0.910	0.38	-2.41
Increase in the unemployment rate	0.015	0.01	2.67	0.082	0.03	2.90
Decrease in the unemployment rate	0.003	0.01	0.41	0.002	0.03	0.09
Indigenous share of Year 8 cohort	-0.717	0.28	-2.52	-3.070	1.16	-2.64
Twelve year old share of Year 8 cohort	0.339	0.05	6.61	1.774	0.25	6.98
State effects						
NSW	0.769	0.01	53.14	0.755	0.04	17.56
VIC	0.779	0.01	58.68	0.767	0.04	19.29
QLD	0.686	0.02	38.36	0.677	0.08	8.91
SA	0.653	0.01	45.47	0.651	0.07	8.81
WA	0.626	0.02	30.53	0.615	0.13	4.89
TAS	0.681	0.02	32.35	0.687	0.09	7.83
NT	0.690	0.09	7.82	0.702	0.29	2.41
ACT	0.847	0.02	56.00	0.845	0.04	23.10
Marginal effects						
Year 12 Repeats	1.577	0.44	3.55	1.575	0.49	3.19
Full-time employment share squared (NSW, VIC, TAS, ACT)	-0.970	0.07	-13.46	-0.946	0.08	-12.06
Full-time employment share squared (QLD, SA, WA, NT)	-0.580	0.11	-5.28	-0.665	0.12	-5.78
Proportion aged 17 at TAFE	-0.190	0.09	-2.10	-0.202	0.08	-2.41
Increase in the unemployment rate	0.015	0.01	2.67	0.018	0.01	2.90
Decrease in the unemployment rate	0.003	0.01	0.41	0.001	0.01	0.09
Indigenous share of Year 8 cohort	-0.717	0.28	-2.52	-0.683	0.26	-2.64
Twelve year old share of Year 8 cohort	0.339	0.05	6.61	0.394	0.06	6.98
Observations		104			104	
Dependent Variable: Mean		0.666			0.739	
Std dev.		0.115			0.550	
Residual Sum of squares		0.078			1.807	
Std dev.		0.030			0.143	
R-squared		0.943			0.942	
F[14, 89]		97.2			95.4	
Probability value		0.000			0.000	
Log likelihood		226.6			63.2	
Restricted(b=0) Log likelihood		77.6			-84.9	
Estd. Autocorrelation of e(i,t)		0.29			0.29	

Appendix 5: Estimates of School 'Retention' from Australian Longitudinal Data

This Appendix exploits data from two Longitudinal Surveys of Australian Youth (LSAY) cohorts to estimate school 'retention' rates in the early and late 1990s. The data are drawn from the *Youth in Transition* 1975 birth cohort (YIT 75) and the *Longitudinal Surveys of Australian Youth* Year 9 cohort (LSAY 95). These data are collected under a program managed jointly by the Australian Council for Educational Research (ACER) and the Department of Education, Science and Training.

The benefits of using such longitudinal data for these purposes should be emphasised. It is possible to measure retention to Year 12 by individuals observed in the school system some years earlier, typically before they reached the minimum school leaving age. If measured carefully, retention estimates based on these data are not subject to influence by migration or other sources of population change, part-time studies or grade repetition. However, age-grade structures and the indigenous share of the school population will influence them. Hence the 'retention' rates described in this appendix are not strictly comparable with any of the adjusted measures described in the body of the paper.

The YIT 75 cohort was an age-based cohort. When surveyed in October 1989, the respondents were aged 14 years. The actual grades students were in across Australia when surveyed in 1989 reflected differences in the structure of the schooling systems, school commencement procedures across Australian jurisdictions and the timing of the survey (or at least, the reference date for age in the survey of the beginning of October). Members of the cohort were drawn from Years 8, 9 and 10 when first surveyed in 1989.

The LSAY 95 cohort was a grade-based panel. Students were in Year 9 in 1995, but varied by age, again depending on differences in the structure of the schooling systems, school commencement procedures across Australian jurisdictions and the timing of the survey (or at least, the reference date for age in the survey of the beginning of October).

For both cohorts, we analyse retention from the beginning of the panel to Year 12 by analysing whether individuals were in Year 12 in the first possible year, given the grade they were in when first surveyed. For YIT 75, this means analysing Year 12 participation in 1991 for those in Year 10 in 1989, in 1992 for those in Year 9 and in 1993 for those in Year 8. For LSAY 95 we analyse Year 12 participation in 1998. The estimate is of the proportion of respondents in 1991, 1992 etc. for whom that year was the first in which they could have been

in Year 12 who were, in fact, in Year 12. Our measure differs from the official retention rate in that the numerator and the denominator are measured over the same group of people.

This approach we adopt to the analysis of the YIT 75 data differs from that adopted in a series of studies conducted under the auspices of ACER. For example, Long, Carpenter, and Hayden (1999) and Marks, Fleming, Long and McMillan (2000) analysed participation in Year 12 by age 19 from the YIT 75 data, though the participation measure used Marks *et al.* (2000) for LSAY 95 is the same as that used here. We prefer to use a conceptually similar measure of Year 12 participation for both cohorts, one that in this case is also closer to that of a retention rate.

There is another source of difference between our estimates and those in the ACER reports. It relates to the way the data from these cohorts are weighted to account for panel attrition.

In LSAY 95 the attrition weights are designed to ensure the sample matches the original distribution of school achievement and gender observed when the sample was first drawn (Marks and Long 2000). The re-weighting procedure corrects for attrition by giving greater weight to males and respondents from low achievement quartiles who continue in the panel in any year than female respondents and those from the higher achievement quartiles.

The weighting schema used for the *Youth in Transition* series differed from *LSAY* procedure in two important respects. First, the weights were based on school attainment rather than school achievement. Second, the school attainment benchmarks are based on information external to the survey data. The benchmarks are based on published ABS school retention data. The approach used is described in more detail in Appendix D of Williams (1987). The weighting procedure aims to ensure that the distribution of the weighted achieved sample across attainment levels from Year 9 to Year 12 matches the ABS population proportions of individuals completing school after Years 9, 10, 11 and 12 by gender, in each Australian jurisdiction and by school type (independent, Catholic and government schools).

Consequently, if we used the available weights for the YIT 75 cohort, we would simply replicate the retention patterns in the ABS data of the early 1990s, including the impact of Year 12 repetition. Rather than do that, we calculate attrition weights like those used for LSAY 95, that is ones designed to match the original distribution of school achievement and gender observed when the YIT sample was first drawn. This allows us to observe the actual differences in retention in the data, rather than impose the patterns evident in the ABS data at the time on our results. The resulting 'retention' estimates appear in Table 5.1.

Table 5.1: Estimated 'retention' rates based on Australian longitudinal data[a]

	91-93	98	Difference	't' value
NSW	66.9	77.0	10.1	4.85
Vic	72.3	79.2	6.9	3.71
Qld	77.5	77.1	-0.4	-0.22
SA	69.3	75.3	6.0	2.52
WA	67.3	69.0	1.7	0.73
Tas	50.2	55.4	5.2	1.47
NT	68.8	58.3	-10.5	-2.21
ACT	82.6	82.6	0.0	0.00
AUST	70.4	75.9	5.5	6.43

(a) The 1991-1993 estimates are derived from the *Youth in Transition* 1975 cohort and the 1998 estimates from the *Longitudinal Surveys of Australian Youth* 1995 cohort. Their calculation is described in Appendix 4.

The estimates show growth in 'retention' in most jurisdictions between the early and the late 1990s, which is broadly consistent with the direction of other evidence presented in this paper. These results contrast those of the results presented in the ACER reports, where Year 12 completion is estimated to be slightly higher in YIT 75 than LSAY 95. This difference in results reflects the alternative approaches to measurement of Year 12 participation in YIT 75 (measured in 1994 by ACER, but in the first relevant year -–1991, 1992 or 1993 by us). The estimated state patterns also differ between ACER's YIT 75 estimates and ours. These differences appear to be primarily an artefact of the alternative weighting procedures.

The comparison made above was repeated using only Year 9 students from YIT 75 (with Year 12 participation measured in 1992) and only 14 year olds from LSAY 95. This involves the comparison of Year 12 participation of a common group across both surveys: 'retention' to Year 12 in three years of 14 year old students in Year 9. The national 'retention' estimates were 74.5 and 77.3 per cent from YIT 75 and LSAY 95 respectively. The pattern of differences between jurisdictions was similar to that shown above for each of the two surveys.